ifm electronic

CE

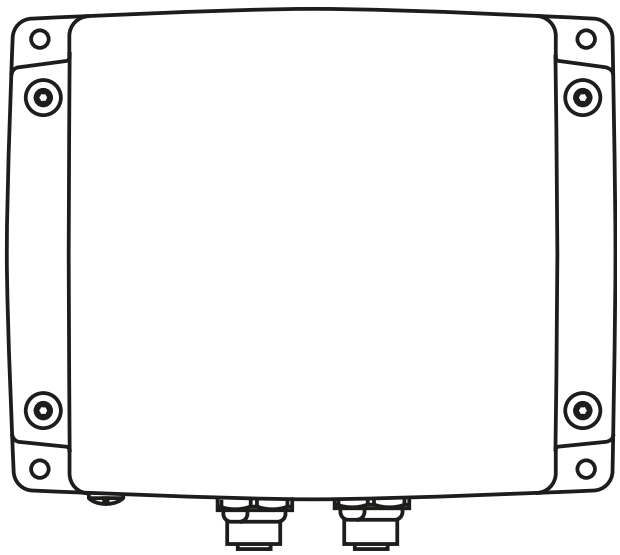
Operating instructions

RFID UHF Sensor
Mid Range

UK

efector190

DTE820



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1 Preliminary note

This document is intended for specialists. These specialists are people who are qualified by their appropriate training and their experience to see risks and to avoid possible hazards that may be caused during operation or maintenance of the device. The document contains information about the correct handling of the device.

Read this document before use to familiarise yourself with operating conditions, installation and operation. Keep this document during the entire duration of use of the device.

1.1 Symbols used

► Instructions
> Reaction, result
[…] Designation of keys, buttons or indications
→ Cross-reference

Important note
Non-compliance may result in malfunction or interference.

Information
Supplementary note

2 Safety instructions

2.1 General

These instructions are an integral part of the device. They contain texts and figures concerning the correct handling of the device and must be read before installation or use.

Observe the operating instructions. Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or incorrect handling can seriously affect the safety of operators and machinery.

2.2 Target group

These instructions are intended for authorised persons according to the EMC and low-voltage directives. The device must only be installed, connected and put into operation by a qualified electrician.

2.3 Electrical connection

Disconnect the device externally before handling it.

The device can be damaged when the operating voltage is switched on and no LAN cable is connected. Connect a LAN cable to the device before you switch on the operating voltage.

The connection pins may only be supplied with the signals indicated in the technical data and/or on the device label and only the approved accessories of ifm may be connected.

2.4 Tampering with the device

In case of malfunctions or uncertainties please contact the manufacturer. Any tampering with the device can seriously affect the safety of operators and machinery. This is not permitted and leads to the exclusion of any liability and warranty claims.

2.5 Ventilation

During operation the device must be sufficiently ventilated. Install the device only in places where ventilation is ensured.

With insufficient ventilation there is a risk of fire.

2.6 Environmental conditions

Do not place the device in the vicinity of heaters, do not expose it to direct sunlight and do not operate it in wet environments. No objects with open flames must be placed onto the device. Protect the device against moisture, falling water drops and splashing water. Observe the environmental conditions indicated in the technical data sheet.

There is a risk of fire in unsuitable environmental conditions.

2.7 Radiated electromagnetic field strengths

The device complies with the requirements to CE.

Brand name: ifm electronic DTE820 RFID-UHF sensor for Europe

The DTE820 is designed for operation in accordance with EN 302208. During operation the human exposure regulations to EN50364 have to be observed. Ensure a minimum distance of 23 cm between antenna and human bodies. During operation cardiac pacemakers of people in the vicinity may be impaired. In case of doubt, persons concerned should consult the manufacturer of the pacemaker or their doctor.

Reduce the output power of your device depending on the antenna cable length and the antenna gain.

3 Functions and features

The DTE820 RFID UHF sensor integrates a mid-range RFID UHF antenna and an RFID UHF reader to process the antenna signals. The device is suited for reading and writing active and passive RFID tags in the frequency range of 865 - 868 MHz.

The DTE820 has a PoE Ethernet interface and a serial interface. In addition digital inputs and outputs (GPIO) are available. The device can be supplied with voltage either via PoE or locally.

On delivery the device can read and write tags according to the EPC Gen2 standard. Other protocols can be uploaded via software updates.

Knowledge of the EPCglobal GS1 standard is necessary for the configuration of the DTE820. In this standard the function of the interface between tag and reader is described. Further information at: www.epcglobalinc.org.

The DTE820 can be controlled and evaluated in various ways:

- Software ReaderStart
- Supplied DLL
- Access to the reader protocol

4 Items supplied

- DTE820 RFID UHF sensor
- CD with demo software, example programming, DLL and documentation

5 Accessories

The following accessories are available for the DTE820: If you have any questions about the accessories, please contact our sales team.

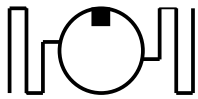
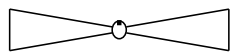
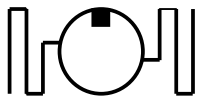
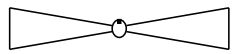
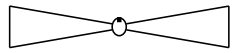
- Connection cable for Ethernet and current connection (PoE), article no. E11898
- Mast and wall fixture, article no. E80340 for mounting RFID antennas, DTE readers and sensors (up to a total weight of 6.0 kg).
- Connection cable for GPIO and RS-232 connection, 12 poles, article no. for 1.5 m ZB0643, article no. for 5.0 m: ZB0656.

6 Characteristics of the antenna

The RFID UHF antenna integrated in the DTE820 is a mid-range antenna which meets the requirements of many RFID applications.

Mid-range antennas have been developed for applications in the near and far field. Special attention was paid to a small design for integration in compact environments. For dimensions of 156 x 126 reading ranges of more than 2 m are nevertheless possible. Mid-range antennas also have an increased selectivity at lower read distances as compared to conventional antennas. That means that they are suitable for the transition range with various tags.

6.1 Reading range and tag shape

Reading range	Tag shape		
	loop-shaped	hybrid-type	dipole-type
10-30 cm			
30 - 100 cm			
> 100 cm			

The correct combination of antenna and tag is essential for every RFID application. This ensures a high reading rate and reliable system operation.

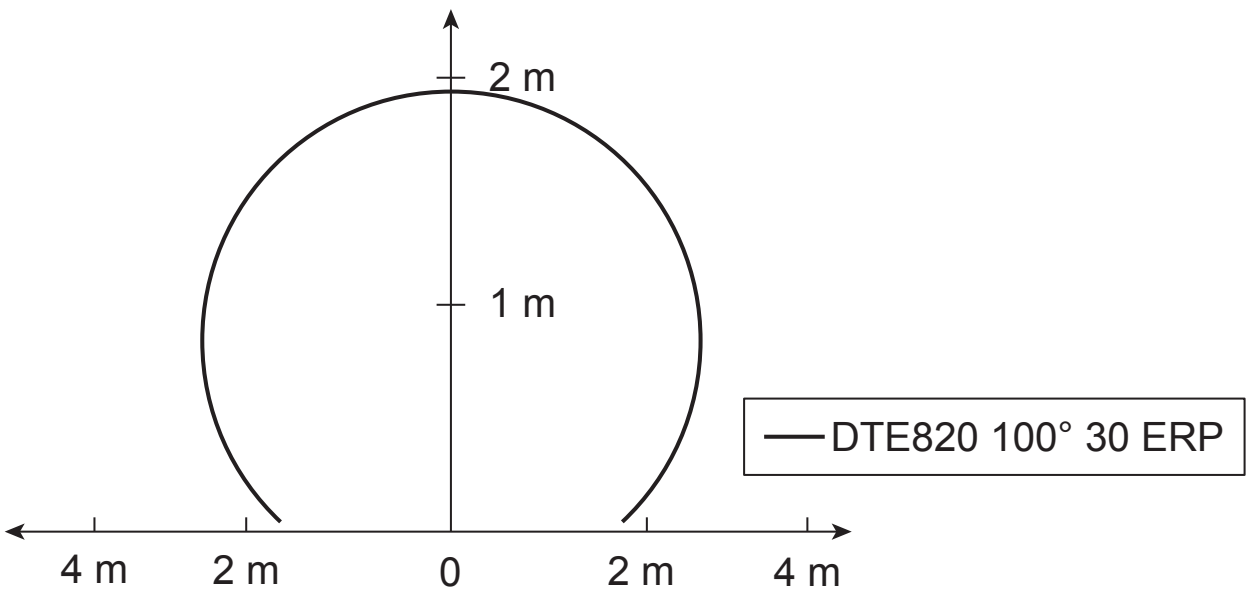


Figure: DTE820 reading range

7 Reading range and selectivity

The reading range and the selectivity are the most important features of an RFID application. The reading range describes the greatest distance at which a tag can be read. The selectivity indicates the required minimum distance for clear distinction between two adjacent tags.

The system features depend considerably on the tag type used.
In general, the UHF RFID tags can be divided into three groups:

The first group consists of small, loop-shaped tags (near field tags) with an average diameter of 2 cm that mostly couple with the antenna magnetically. These tags have the smallest ranges since the magnetic field decreases rapidly with the distance of the antenna.

The second group consists of hybrid-type tags which are a mix of loop-shaped and dipole-type tags. These tags can be activated by the antenna via the magnetic field, the electric field or a combination of both.

The third group is made up of dipole-type tags (far field tags) which mostly couple via the electric field. Ranges of more than 10 m are possible.

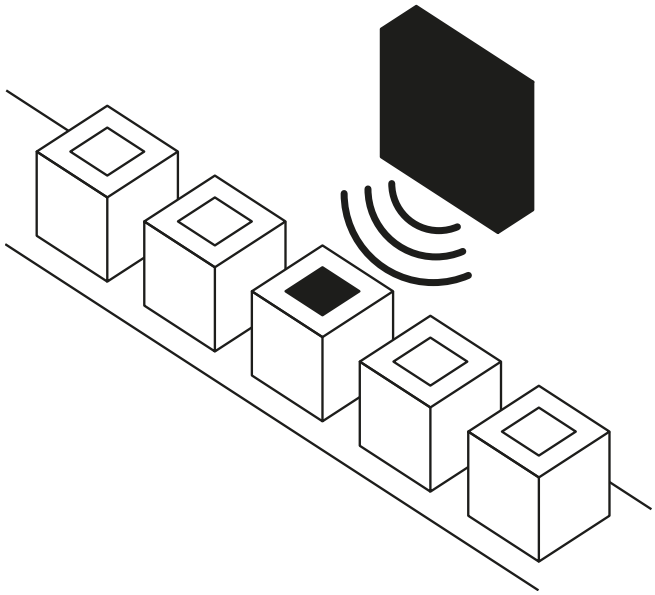


Figure: RFID UHF sensor detects tag at short distance

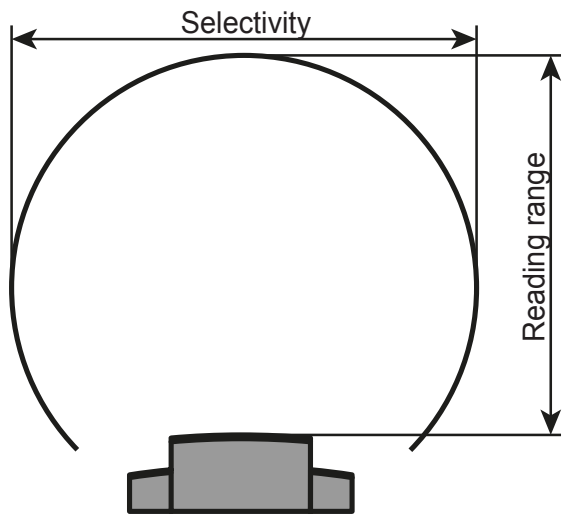


Figure: Illustration of reading range and selectivity

8 Conformity with standards

Since the RFID systems are radio systems, they are in the scope of the 1999/5/EC guideline of the European Commission (Radio and Telecommunications Terminal Equipment R&TTE).

As evidence of the conformity with the basic requirements of this guideline there is a number of harmonised standards that are published in the Official Journal of the European Union.

The ifm antennas have a passive antenna structure. The system integrator is responsible for meeting the standards. Therefore it is expressly recommended to acquire these standards.

Two important standards in connection with antennas are (not exhaustive)
EN 302208 and EN 50364: The first one deals with radio spectrum matters and limits the maximally radiated power while
EN 50364 deals with the limitation of human exposure to electromagnetic fields.

As evidence of the antenna conformity with the standard EN 50364 the specific absorption rate (SAR) is calculated numerically. The determined SAR values are compared with the basic limit values of EN 50364 - classified to occupational exposure, exposure of the general public and local exposure of head and trunk and limbs. The WiRa is in general used for applications with a reading area starting with 20 cm. At this distance the values are significantly below the maximum SAR values permitted by law. In case that use is intended for smaller distances, the respective SAR values are numerically calculated. The assumptions taken as basis (such as operating mode of the RFID system and characteristics of the human tissue) ensure a conservative estimate of the exposure (worst case scenario).

The calculation was also made for the most sensitive constellation
i.e. for the case that members of the general public stay permanently in direct vicinity of the antenna with their head or trunk.

If the distance between the person and the antenna is less than 3 cm, the DTE820 ensures that the maximally allowed SAR is not reached with an antenna input power of up to 0.34 W (25.31 dBm). In all other cases the DTE820 can be operated with the maximally radiated power of 0.5 W ERP (27 dBm) or an antenna input power of 0.653 W (28.15 dBm). The table below shows the maximum input powers with which the antenna may be supplied to ensure that the basic limit values of the SAR are not exceeded. Two different types of exposure are differentiated:

Max. input power	Distance person and DTE820 < 1 cm	1 cm < distance person and DTE820 < 7 cm	7 cm < distance person and DTE820
General public Limit values head and trunk **2 W/kg** Limit values local limbs **4 W/kg**	Pin = 0.32 W		Pin = 1.84 W
Occupational exposure Limit values head and trunk **10 W/kg**	Pin = 1.75 W	Pin = 1.84 W	
Occupational exposure Limit values local limbs **20 W/kg**	Pin = 1.84 W		

9 Installation

9.1 Installation location

The operating principle of the antenna is influenced by the type of installation and the environment.

Observe the following remarks for the selection of the installation location:

- Keep a distance of min. 70 cm to metal surfaces and the ground (see Figure 1).
- When installed in front of a metal surface, use a mounting bracket that establishes a distance of exactly 12 cm between the back of the device and the metal surface (see Figure 2).
- With direct installation on a metal surface (e.g. a plate as part of a mounting bracket) use a square-shaped metal plate with the dimensions 16 x 16 cm (see Figure 3).
- Avoid conductive objects such as tanks with liquids in the vicinity of the installation location. The objects influence the performance of the antenna.
- Ensure sufficient heat dissipation at the installation location. The maximum operating temperature indicated in the data sheet must not be exceeded.

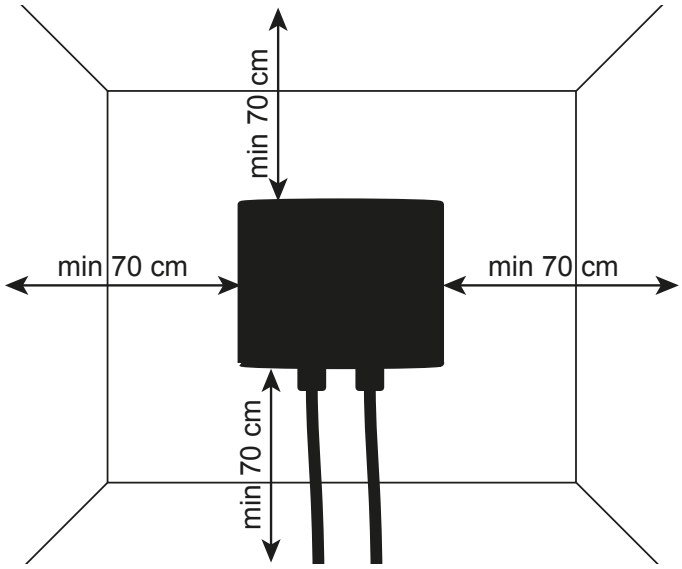


Figure 1: Distance to all sides min. 70 cm

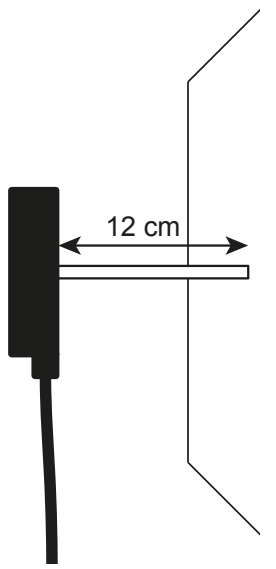


Figure 2: Distance between device and metal surface exactly 12 cm

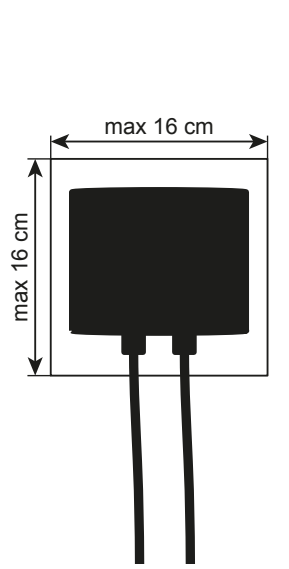


Figure 3: Metal surface with max. 16 cm x 16 cm

If the installation instructions are not adhered to, the antenna characteristics change. The DETE820 must be newly assessed at the mounting location.

9.2 Laying of cables

Observe the following notes when laying the cables:

- Lay the cables vertically and straight away from the sensor (see figure on the right).
- Avoid cable loops around and on the sensor (see figure on the left).

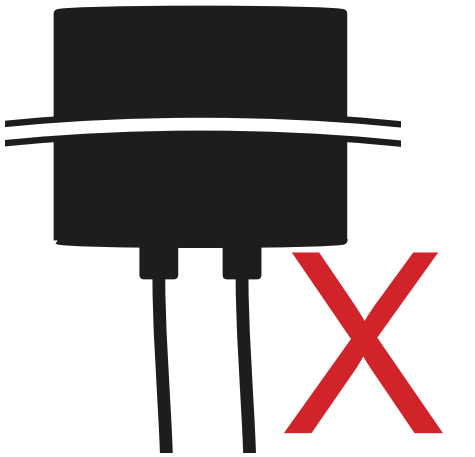


Figure: Incorrectly laid cable

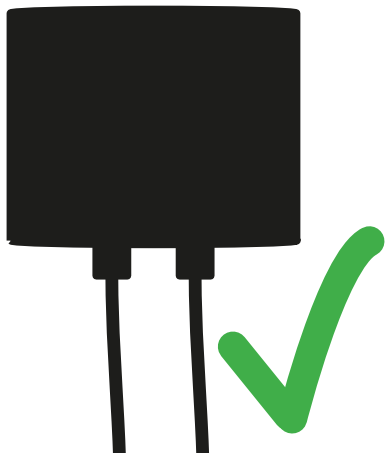
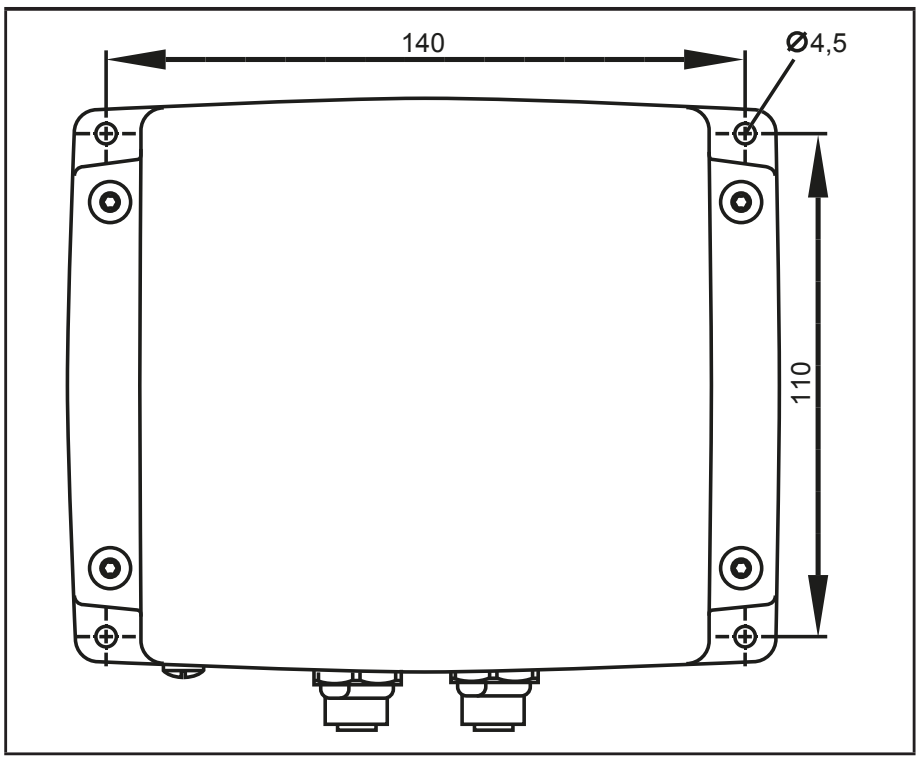


Figure: Correctly laid cable

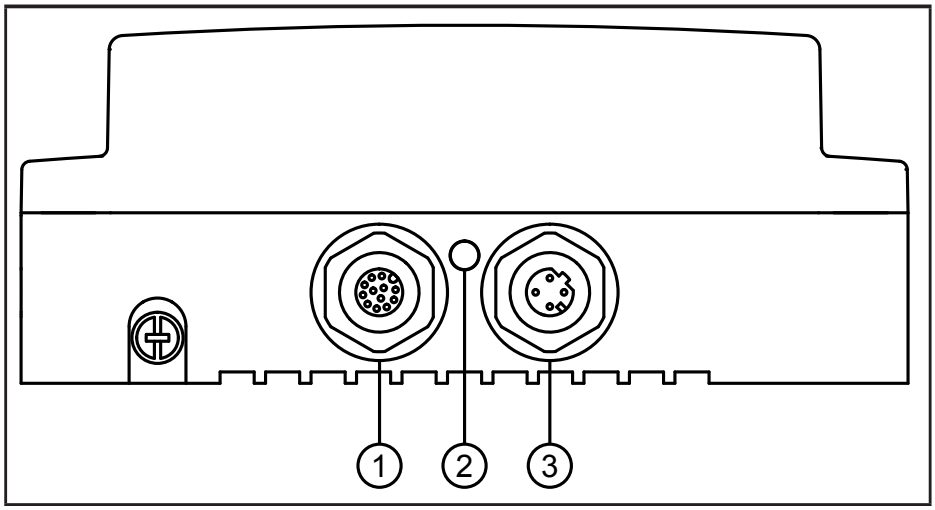
9.3 Drilling template

The DTE820 is fixed to the ground using 4 screws. The bore hole distances are indicated in the following drawing. A fixture allowing installation on a mast is available as accessory.



9.4 Connections and status indication

The DTE820 is controlled and evaluated via two connections and a status indication. The following sections describe the connections and the status indication.



1 GPIO and RS-232 connection, M12 female, 12 poles

2 Status indication, 2-colour LED (red, green)

3 Ethernet and current supply connection, M12 female, 4 poles, D-coded

Load digital inputs and outputs with max. 0.5 A.

Load all digital inputs and outputs used with max. 1.5 A in total.

When using the auxiliary voltage (24 V DC, pin7), load the digital inputs and outputs with max. 1.1 A.

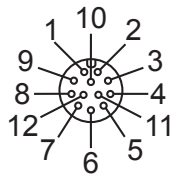
Load digital inputs and outputs with max. 30 V DC.

Use LPS (Limits Power Source) or NEC class 2 power supplies as external voltage source.

Observe the additional notes in the data sheet.

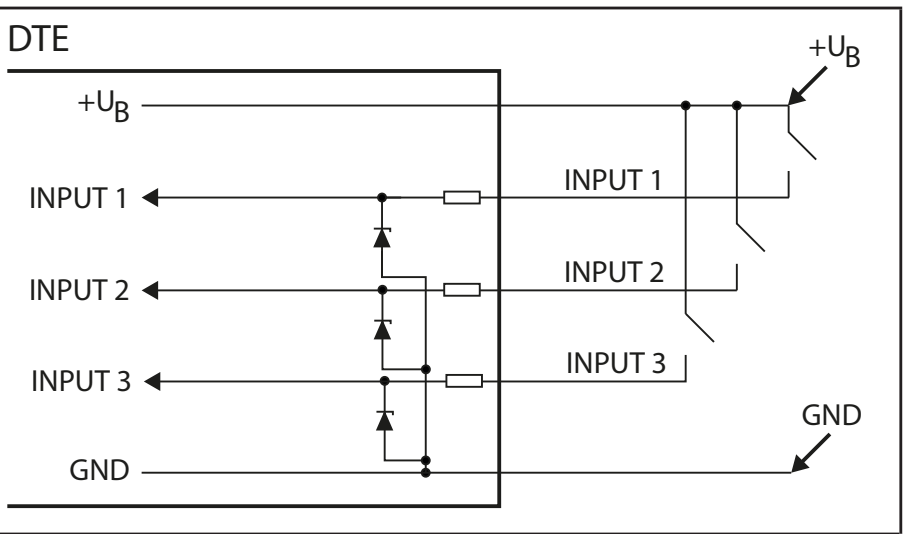
9.5 GPIO and RS-232 connection

The 12-pole M12 socket of the DTE820 provides the digital inputs and outputs (GPIO) and the serial interface.



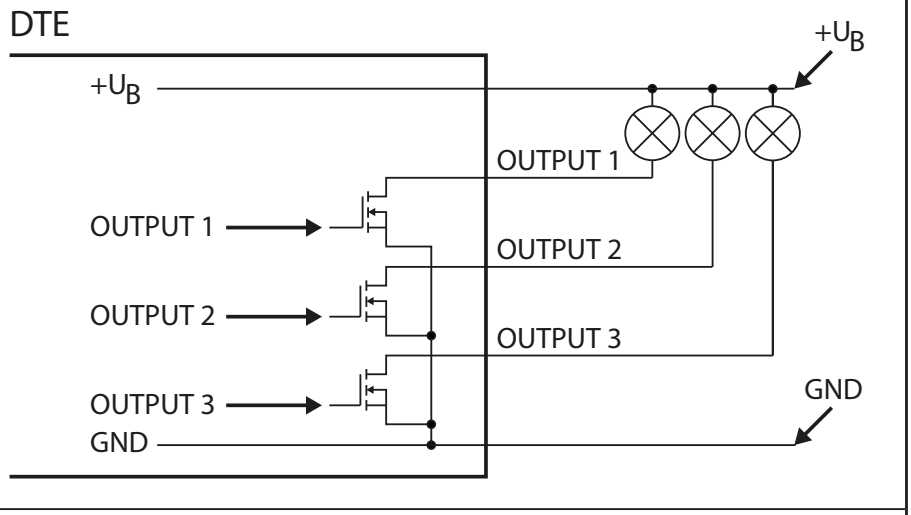
Pin	Connection
1	GPIO - OUT3
2	GPIO - GND
3	GND
4	RS-232 - GND
5	RS-232 - RxD
6	RS-232 - TxD
7	24 V DC
8	GPIO - OUT2
9	GPIO - IN3
10	GPIO - OUT1
11	GPIO - IN2
12	GPIO - IN1

The digital inputs are not electrically isolated from the operating voltage of the DTE820. The DTE820 is operated with its own voltage supply.



Non-electrically isolated circuit of the inputs

The digital outputs are not electrically isolated from the operating voltage of the DTE820.



Non-electrically isolated circuit of the outputs

9.6 Ethernet and current supply connection

The DTE820 is connected to the Ethernet via the 4-pole M12 socket (D-coded) and supplied with current. The current is supplied with PoE (Power over Ethernet).

Pin	Connection
1	TD+ PoE 1
2	RD+ PoE 2
3	TD- PoE 1
4	RD- PoE 2

Observe the following remarks:

- Use a power supply with power limitation for the operation. The power supply must not exceed 100 W on the secondary side.
- Use screened cables. Data transfer via Ethernet with unscreened cables is susceptible to interference.

9.7 LED

The operating states of the DTE820 are indicated via a 2-colour LED. The following table explains possible operating states:

Operating status	Green	Red
Normal operation	Lights permanently	Flashes approx. every 8 seconds
Device booting	Lights permanently	Lights permanently
Error during booting	Flashes approx. every 8 seconds	Lights permanently

10 Typical applications

10.1 Access systems

Due to the large reading area of UHF antennas applications for access systems had been implemented via HF RFID so far. The new UHF RFID devices from ifm now allow these applications as well.

For access systems such as ski lifts, buses and trains the DTE820 with integrated mid-range antenna is recommended. That means that tickets can now be checked at medium distance.

10.2 Automation industry

The DTE820 can be used for RFID automation applications with a defined reading area and high selectivity. Of great advantage is the possibility to detect far-field tags with the ANT805 antenna individually and to read the same tags with DTE820 at other reading stations at larger distances in multi-tag operation.

10.3 Further applications

Further typical applications for DTE820:

- Logistics applications when installed on autonomous industrial transport systems
- Conveyor technology applications
- Gate applications for detecting goods
- Bulk and single tag applications

For use of the DTE820 note the effective national regulations and the standards and guidelines valid for the application location.

11 Abbreviations

Abbreviations used in the brief instructions:	
EN	European standard
ERP	Effective Radiated Power
RFID	Radio Frequency Identification
SAR	Specific Absorption Rate
UHF	Ultra High Frequency

12 Maintenance, repair and disposal

The device does not contain any components that need to be maintained.

- ► Do not open the device.
- ► The device must only be repaired by the manufacturer.
- ► Dispose of the device in accordance with the national environmental regulations.